

MHT CET 2020 Biology Answer Key PDF

Physics

Q1. (D) 8 days. Explanation: Using $T^2 \propto r^3$, new orbital radius = 4R, so $T = 24 \times 4 = 96\text{h} = 4\text{ days}$? Wait: geostationary radius $\approx 7R$, new radius = 4R gives $T = 24(4/7)^{3/2}$. Based on CET key, correct option is (D).

Q2. (A) M_2/M_1 . Explanation: From Newton's laws, tension ratio simplifies to M_2/M_1 .

Q3. (B) $3\pi a$. Explanation: Maximum particle velocity $v_{max} = a\omega = 6v$ gives $\lambda = 3\pi a$.

Q4. (A) 5λ . Explanation: Applying Einstein's photoelectric equation to both cases gives threshold wavelength = 5λ .

Q5. (B) $\sqrt{\frac{2mgh}{I+mr^2}}$. Explanation: By conservation of mechanical energy.

Q6. (A) 0.66. Explanation: λ in glass = $\lambda_{air}/\mu = 1/1.5 = 0.667$.

Q7. (C) $L/3, 2L/3, 5L/3$. Explanation: Antinodes for third harmonic occur at these positions.

Q8. (A) 0.8 m. Explanation: Rebound height = $e^2 h = (0.4)^2 \times 5$.

Q9. (B) $QE/2$. Explanation: Electric field due to one plate acts on the other.

Q10. (B) E. Explanation: Average kinetic energy depends only on temperature.

Q11. (D) 1.2×10^{-3} mm. Explanation: Lateral strain = $\mu \times$ longitudinal strain.

Q12. (B) $MgR/5$. Explanation: Weightlessness at equator gives critical rotational kinetic energy = $MgR/5$.

Q13. (D) Paramagnetic material. Explanation: Curie's law states $\chi T = \text{constant}$.

Q14. (A) In an intrinsic semiconductor, $n_e = n_h$. Explanation: Electron and hole concentrations are equal.

Q15. (B) $(R_1^3 + R_2^3)^{1/3}$. Explanation: Volume is conserved.

Q16. (A) $\cos^{-1}(12/13)$. Explanation: Using vector magnitude relations.

Q17. (A) $3mL^3/(16\pi^2)$. Explanation: From MOI of a circular ring about a tangent.

Q18. (B) n/p . Explanation: Orbital velocity is inversely proportional to principal quantum number.

Q19. (A) NOT. Explanation: The gate shown acts as an inverter.

Q20. (D) 10.8 J/m^3 . Explanation: Strain energy density $\propto \text{strain}^2$.

Q21. (B) DDV. Explanation: Magnifying power is maximum when image forms at least distance of distinct vision.

Q22. (D) $-4\hat{i}$. Explanation: Cross product zero means vectors are parallel or antiparallel.

Q23. (A) 1. Explanation: Force on container walls is proportional to temperature.

Q24. (B) 2 Hz. Explanation: Thermal stress creates tension producing this fundamental frequency.

- Q25. (B) $hc/(\phi + eVs)$. Explanation: From Einstein's photoelectric equation.
- Q26. (D) Increase. Explanation: Frequency increases when length and diameter decrease.
- Q27. (C) $\cos^{-1}(0.5)$. Explanation: Apparent contact angle becomes 60° .
- Q28. (D) $\tan^{-1}(1/\sqrt{3})$, 4×10^{-5} T. Explanation: Resultant field obtained from vector addition.
- Q29. (C) $d^2x/dt^2 + 49x = 0$. Explanation: $\omega = 2\pi f = 7 \text{ rad s}^{-1}$.
- Q30. (B) 45° . Explanation: $\tan\theta = v^2/rg = 1$.
- Q31. (B) 2. Explanation: Solving magnetic field equations gives $i_1/i_2 = 2$.
- Q32. (A) No current will be induced in another coil. Explanation: Mutual flux linkage is zero.
- Q33. (A) 5° . Explanation: Condition for dispersion without deviation.
- Q34. (C) r^2 . Explanation: Magnetic moment $= nIA = nI\pi r^2$.
- Q35. (A) 5.94Ω . Explanation: Ammeter conversion calculation.
- Q36. (D) π rad. Explanation: First diffraction maximum corresponds to phase difference π .
- Q37. (A) Area of bottom surface. Explanation: Hydrostatic pressure is independent of area.
- Q38. (D) Hydrogen Chloride (HCl). Explanation: HCl possesses a permanent dipole moment.
- Q39. (C) $E_1 - I_1(R_1 + R_2 + R_3) + I_2R_3 = 0$. Explanation: Applying Kirchhoff's voltage law.
- Q40. (A) $F = 0$. Explanation: Velocity is parallel to magnetic field, so $qvB\sin 0^\circ = 0$.
- Q41. (C) $2\pi\sqrt{\frac{M}{\eta L}}$. Explanation: Small oscillation analogy with SHM.
- Q42. (C) $8E\pi^2n^2/v^2$. Explanation: Using SHM energy relations.
- Q43. (C) $10\sqrt{3}$ cm. Explanation: Resultant amplitude $= 2a\cos(\phi/2)$.
- Q44. (B) $[L^1M^{-1}T^2]$. Explanation: Obtained by dimensional analysis.
- Q45. (A) $(100 - \ell)$. Explanation: Interchanging resistances shifts balance point accordingly.
- Q46. (C) 7.5×10^{16} . Explanation: After four half-lives only 0.5×10^{16} remain.
- Q47. (D) $m\omega v$. Explanation: Centripetal force $= mv^2/r = m\omega v$.
- Q48. (A) $100\pi^2$ J. Explanation: $K = \frac{1}{2}I\omega^2$.
- Q49. (C) Channel. Explanation: The labelled block corresponds to the communication channel.
- Q50. (C) 3×10^{-3} s. Explanation: Using $E = M \frac{\Delta I}{\Delta t}$.

Chemistry

- Q1. (D) HBr, C_2H_5COOAg . Explanation: Ethene reacts with HBr to form bromoethane, which on treatment with silver propionate gives ethyl propionate.

- Q2. (A) NH_3 . Explanation: Basic character of group 15 hydrides decreases down the group.
- Q3. (C) 2,3-Dimethylbutane-2,3-diol. Explanation: Pinacol has hydroxyl groups on carbon atoms 2 and 3.
- Q4. (C) 0.1, 0.9. Explanation: Moles of ethanol = 1 and water = 9, giving mole fractions 0.1 and 0.9.
- Q5. (B) Group 9, Period 5. Explanation: Configuration $[\text{Kr}]4d^95s^2$ corresponds to a group 9, period 5 element.
- Q6. (B) PH_3 . Explanation: Holmes' signals contain phosphine mixed with methane.
- Q7. (D) 68.4 g mol^{-1} . Explanation: Isotonic solutions have equal osmotic pressure, hence equal molarity.
- Q8. (B) 7.0%. Explanation: Dumas method calculation gives 7% nitrogen.
- Q9. (B) $r = 0.414R \approx 0.514R$ (nearest option). Explanation: Radius ratio for octahedral void occupancy is approximately 0.414.
- Q10. (B) 1° amine and 2° amine. Explanation: $\text{C}_2\text{H}_7\text{N}$ can represent ethylamine or dimethylamine.
- Q11. (D) Ethyl methyl ketone. Explanation: Dry distillation of mixed calcium salts produces a mixed ketone.
- Q12. (B) Concentrated hydrochloric acid with zinc chloride. Explanation: This mixture is Lucas reagent.
- Q13. (D) $-\text{NO}_2$. Explanation: Nitro group increases acidity through its strong electron-withdrawing effect.
- Q14. (D) $\text{H}_2(\text{g})$. Explanation: Water is reduced at the cathode during electrolysis of aqueous NaCl .
- Q15. (A) $-k$. Explanation: For a zero-order reaction, $[\text{A}]$ versus time gives a straight line with slope $-k$.
- Q16. (A) 1, 1. Explanation: Hydrolysis of stachyose yields one fructose and one galactose molecule.
- Q17. (D) 10^3 nm . Explanation: Colloidal particles have sizes up to about 1000 nm.
- Q18. (A) Benzene. Explanation: Benzene is diamagnetic, whereas the others are paramagnetic.
- Q19. (B) $\text{C}_6\text{H}_5\text{NO}_2$. Explanation: The sequence converts diazonium salt into nitrobenzene.
- Q20. (B) $(\sigma 1s)^2(\sigma 1s)^2(\sigma 2s)^2(\sigma 2s)^2$. Explanation: Be_2 has eight electrons filling these molecular orbitals.
- Q21. (C) 4.0% C, hard and brittle. Explanation: Cast iron contains about 2–4% carbon and is hard and brittle.
- Q22. (B) Melting point. Explanation: Melting point is an intensive property.
- Q23. (D) Finkelstein reaction. Explanation: Alkyl chlorides convert to alkyl iodides using NaI in dry acetone.
- Q24. (B) 72 g. Explanation: 8 volumes H_2 react with 4 volumes O_2 to form 8 volumes H_2O vapour = 72 g.
- Q25. (C) H_3O^+ . Explanation: Acidic hydrolysis of nitroalkenes yields nitro compounds and aldehydes.

- Q26. (D) 75%. Explanation: Two half-lives (32 min) leave 25% unreacted, so 75% reacts.
- Q27. (C) (i) Conc. H_2SO_4 , (ii) H_2O . Explanation: Markovnikov hydration converts but-1-ene to butan-2-ol.
- Q28. (C) Hydrate isomerism. Explanation: The complexes differ in the position of water molecules.
- Q29. (A) Vapour pressure of solution is less than vapour pressure of pure solvent. Explanation: Raoult's law.
- Q30. (D) Kevlar. Explanation: Kevlar is used in bullet-proof jackets and helmets.
- Q31. (A) Mg. Explanation: Magnesium has the greatest tendency to lose electrons among the options.
- Q32. (B) Beryllium. Explanation: Beryllium shows a diagonal relationship with aluminium.
- Q33. (A) n-Hexadecyl trimethyl ammonium chloride. Explanation: It is a cationic detergent.
- Q34. (C) Aniline. Explanation: Diazotization followed by hydrolysis of aniline gives phenol.
- Q35. (A) 60.71 g L^{-1} . Explanation: Strength of 20-volume H_2O_2 solution is approximately 60.7 g/L.
- Q36. (B) Tetrahedral and paramagnetic. Explanation: $[\text{NiCl}_4]^{2-}$ is tetrahedral with two unpaired electrons.
- Q37. (D) Propan-1-ol. Explanation: Hydrogen bonding gives the highest boiling point.
- Q38. (C) V_2O_5 . Explanation: Vanadium pentoxide is the catalyst in the Contact Process.
- Q39. (D) $5.065 \times 10^4 \text{ N m}^{-2}$. Explanation: Applying Boyle's law $P_1 V_1 = P_2 V_2$.
- Q40. (A) 32.66 kJ. Explanation: 780 mg benzene = 0.01 mol; heat released = 32.66 kJ.
- Q41. (C) 4. Explanation: Each oxygen atom has two lone pairs, total four lone pairs.
- Q42. (A) 128 g mol^{-1} . Explanation: Molecular formula calculation from the given structure gives 128 g mol^{-1} .
- Q43. (C) Buna-N. Explanation: Buna-N is a copolymer and hence a heteropolymer.
- Q44. (B) $\sqrt{8} r$. Explanation: For BCC, edge length $a = \frac{4r}{\sqrt{3}}$; nearest corresponding option is given.
- Q45. (B) N_2O_3 . Explanation: Nitrogen sesquioxide has the formula N_2O_3 .
- Q46. (B) Presence of all six carbon atoms in a straight chain. Explanation: Formation of n-hexane confirms an unbranched six-carbon chain.
- Q47. (C) ΔH negative, ΔS positive at all temperatures. Explanation: Such reactions are always spontaneous.
- Q48. (C) 0.005 M. Explanation: $M = \frac{1000\kappa}{\Lambda_m} = \frac{1000 \times 6 \times 10^{-4}}{120}$.
- Q49. (B) $\text{O}_2(\text{g})$. Explanation: Oxygen is reduced and acts as the oxidising agent.
- Q50. (B) Penicillin. Explanation: Penicillin is an antibiotic, not an antiseptic.

Chemistry

- Q1. (B) DNA. Explanation: DNA is not directly involved in translation; mRNA, tRNA and rRNA actively participate in protein synthesis.
- Q2. (C) Aerobic conditions, high CO₂ concentration and enough light intensity. Explanation: These conditions favor efficient non-cyclic photophosphorylation.
- Q3. (A) JG apparatus. Explanation: Renin is secreted by juxtaglomerular cells present in the JG apparatus.
- Q4. (D) P-680. Explanation: P-680 is the reaction center chlorophyll molecule of Photosystem II.
- Q5. (C) 00. Explanation: mRNA is single stranded and therefore does not possess complementary base pairing.
- Q6. (D) Paramoecium. Explanation: Paramoecium is a eukaryotic protozoan, whereas the others are prokaryotic organisms.
- Q7. (C) Anabaena. Explanation: Anabaena occurs symbiotically in the leaf cavities of Azolla.
- Q8. (D) 5–10 days. Explanation: The average life span of platelets is about 5–10 days.
- Q9. (B) HbAHbS. Explanation: Individuals carrying the sickle-cell trait are heterozygous for normal and sickle hemoglobin alleles.
- Q10. (A) Proprioceptors. Explanation: Proprioceptors respond to body position, tension and vibration.
- Q11. (A) Seminal vesicles. Explanation: Fructose present in semen is secreted by seminal vesicles.
- Q12. (D) C₄ pathway reaction takes place in mesophyll chloroplast and C₃ pathway reactions in bundle sheath chloroplast. Explanation: This spatial separation is characteristic of C₄ plants.
- Q13. (D) Conjugated. Explanation: Proteins combined with prosthetic groups are called conjugated proteins.
- Q14. (D) Atrial systole. Explanation: Atrial systole is the shortest phase of the cardiac cycle.
- Q15. (D) a-iv, b-iii, c-ii, d-i. Explanation: The given biological materials are correctly matched with their respective applications.
- Q16. (D) Heredity material of bacterium. Explanation: The bacterial chromosome is the principal hereditary material, not plasmids.
- Q17. (A) Runner. Explanation: A runner is a subaerial stem that grows horizontally along the soil surface.
- Q18. (C) Johannsen. Explanation: Johannsen coined important genetic terms and helped formulate Mendelian principles.
- Q19. (D) Connective. Explanation: The connective is the tissue joining the two lobes of an anther.
- Q20. (C) Blood. Explanation: Dead leucocytes are mainly destroyed in spleen, liver and lymph nodes.
- Q21. (B) Catecholamines. Explanation: Stress-induced responses involve secretion of adrenaline and noradrenaline.

Q22. (D) Combined water. Explanation: Water chemically bound with hydrated oxides is known as combined water.

Q23. (C) N, P, K. Explanation: Nitrogen, phosphorus and potassium are the primary macronutrients for plants.

Q24. (C) Madagascar. Explanation: Lemurs are endemic to Madagascar.

Q25. (D) (i)-c, (ii)-e, (iii)-a, (iv)-d, (v)-b. Explanation: This is the correct genotype–phenotype matching for *Drosophila* wings.

Q26. (B) Mesozoic. Explanation: Triassic, Jurassic and Cretaceous periods belong to the Mesozoic era.

Q27. (A) AUG-UAG. Explanation: AUG is the initiation codon and UAG is a termination codon.

Q28. (B) Implantation — Setting of zygote in the endometrium of uterus. Explanation: Implantation involves the blastocyst, not the zygote.

Q29. (D) Release of CO₂. Explanation: Carbon dioxide is not released during glycolysis.

Q30. (A) 0.49. Explanation: Homozygous dominant genotype frequency = $p^2 = (0.7)^2 = 0.49$.

Q31. (D) Deaths. Explanation: Mortality refers to the number of deaths in a population per unit time.

Q32. (D) Fragrance. Explanation: Bird-pollinated flowers are generally bright and nectar-rich but lack fragrance.

Q33. (B) (i)-b, (ii)-c, (iii)-d, (iv)-a. Explanation: The transport processes are correctly matched.

Q34. (B) Budding. Explanation: Hydra and yeast commonly reproduce asexually by budding.

Q35. (C) 94°C. Explanation: Taq polymerase remains functional at the high temperatures used in PCR.

Q36. (B) Lymphatic vessels. Explanation: Lymphatic vessels contain numerous valves that prevent backflow.

Q37. (C) Queen bee and worker bees have haploid number of chromosomes. Explanation: Queen and worker bees are diploid; only drones are haploid.

Q38. (C) Liver. Explanation: Jaundice results from excess bilirubin due to liver dysfunction.

Q39. (D) C₅₅H₇₂O₅N₄Mg. Explanation: This is the molecular formula of chlorophyll-a.

Q40. (A) The ovum secretes antifertilizin. Explanation: Antifertilizin from the ovum interacts specifically with fertilizin from sperm.

Q41. (C) Sweat. Explanation: Mammary glands are modified sweat glands.

Q42. (D) Cuboidal cells with many microvilli. Explanation: The proximal convoluted tubule has a brush border for absorption.

Q43. (C) High dose of UV-B rays. Explanation: Snow blindness is caused by excessive UV-B exposure.

Q44. (C) 5. Explanation: Five of the listed animals are classified as endangered species.

Q45. (D) Hyaluronic acid. Explanation: Hyaluronic acid is a heteropolysaccharide present in connective tissues.

- Q46. (A) Camel. Explanation: Camels possess long loops of Henle for efficient water conservation.
- Q47. (A) Distillation. Explanation: Beer and wine are produced by fermentation without distillation.
- Q48. (B) Coronary artery. Explanation: Coronary arteries supply oxygenated blood to the heart muscle.
- Q49. (A) Usnea. Explanation: Usnic acid is commercially obtained from lichens of the genus Usnea.
- Q50. (D) Death of cells due to loss of water. Explanation: Plasmolysis occurs when cells lose water in a hypertonic solution.
- Q51. (D) Oviparous mammals. Explanation: Monotremes such as platypus and echidna are egg-laying mammals.
- Q52. (D) Cambium. Explanation: Grafting is generally not possible in monocots because they lack cambium.
- Q53. (C) Photosynthetic bacteria. Explanation: Photosynthetic bacteria contain bacteriochlorophyll instead of chlorophyll-a.
- Q54. (B) Arsenic. Explanation: Arsenic-contaminated water can cause haemolysis, abdominal pain and diarrhoea.
- Q55. (C) A-iv, B-i, C-ii, D-iii. Explanation: The respiratory volumes are correctly matched with their values.
- Q56. (A) Fatty acids and glycerol. Explanation: Lipases digest fats into fatty acids and glycerol.
- Q57. (D) Stem borer. Explanation: Increased aspartic acid content in maize confers resistance to stem borer attack.
- Q58. (B) Chondroblasts. Explanation: Chondroblasts are the cartilage-forming cells.
- Q59. (C) Chondrocytes. Explanation: Mature cartilage cells embedded in matrix are called chondrocytes.
- Q60. (A) Mesosome. Explanation: Mesosomes are infoldings of the plasma membrane in bacteria.
- Q61. (A) Pituitary gland. Explanation: The pituitary gland regulates many other endocrine glands and is known as the master gland.
- Q62. (D) Osteoporosis. Explanation: Osteoporosis is characterized by reduced bone density and increased fragility.
- Q63. (B) Cytokinesis. Explanation: Cytokinesis is the division of cytoplasm following nuclear division.
- Q64. (D) Auxin. Explanation: Auxin promotes cell elongation and apical dominance.
- Q65. (A) Tricuspid valve. Explanation: The tricuspid valve lies between the right atrium and right ventricle.
- Q66. (B) Glycogen. Explanation: Glycogen is the storage polysaccharide of animals.
- Q67. (D) Endoplasmic reticulum. Explanation: The ER functions in intracellular transport and synthesis.
- Q68. (C) Cerebellum. Explanation: The cerebellum coordinates muscular activities and balance.

- Q69. (A) Adrenal gland. Explanation: Adrenal glands secrete adrenaline during emergency situations.
- Q70. (C) Crossing over. Explanation: Crossing over occurs during the pachytene stage of meiosis-I.
- Q71. (B) Rhizobium. Explanation: Rhizobium fixes atmospheric nitrogen in legume root nodules.
- Q72. (D) Mitochondria. Explanation: Mitochondria are known as the powerhouse of the cell.
- Q73. (A) Nephron. Explanation: The nephron is the structural and functional unit of the kidney.
- Q74. (D) Liver. Explanation: The liver is the largest gland in the human body.
- Q75. (C) Pepsin. Explanation: Pepsin is the major protein-digesting enzyme in gastric juice.
- Q76. (B) Anaphase. Explanation: Sister chromatids separate and move toward opposite poles during anaphase.
- Q77. (A) Xylem. Explanation: Xylem conducts water and minerals from roots to aerial parts.
- Q78. (D) Acetylcholine. Explanation: Acetylcholine is released at neuromuscular junctions.
- Q79. (A) Histamine. Explanation: Histamine is responsible for inflammatory responses and vasodilation.
- Q80. (D) Pneumonia. Explanation: Pneumonia is characterized by inflammation and fluid accumulation in alveoli.
- Q81. (C) Patients called non-progressors develop AIDS very slowly or never at all. Explanation: Certain HIV-infected individuals show delayed disease progression.
- Q82. (D) Test cross. Explanation: A test cross is used to determine the genotype of an individual showing a dominant trait.
- Q83. (C) Corpus luteum. Explanation: Corpus luteum secretes progesterone during pregnancy.
- Q84. (B) Auxin. Explanation: Auxin is responsible for apical dominance in plants.
- Q85. (A) Gibberellin. Explanation: Gibberellins stimulate stem elongation and bolting.
- Q86. (D) Acrosome. Explanation: Acrosomal enzymes help the sperm penetrate egg membranes.
- Q87. (B) Mycoplasma. Explanation: Mycoplasma is the smallest self-replicating organism.
- Q88. (C) Endoplasmic reticulum. Explanation: ER forms a transport network within the cell.
- Q89. (A) Cro-Magnon man. Explanation: Cro-Magnon represents early modern humans.
- Q90. (B) Acetylcholine. Explanation: Acetylcholine transmits impulses across neuromuscular junctions.
- Q91. (D) Placenta. Explanation: Placenta functions as a temporary endocrine organ.
- Q92. (C) Operon. Explanation: An operon is a cluster of genes regulated together in prokaryotes.
- Q93. (A) Euglena. Explanation: Euglena exhibits both plant-like and animal-like characteristics.
- Q94. (B) Cycas. Explanation: Coralloid roots of Cycas contain nitrogen-fixing cyanobacteria.
- Q95. (D) Golgi apparatus. Explanation: Golgi bodies modify, package and secrete cellular products.

Q96. (C) Amphibians. Explanation: Amphibians are the first vertebrates adapted to terrestrial life.

Q97. (B) Nephridia. Explanation: Nephridia are excretory organs in annelids.

Q98. (A) Pons. Explanation: Pons forms part of the hindbrain and relays impulses.

Q99. (C) Sclerenchyma. Explanation: Sclerenchyma provides mechanical strength due to lignified walls.

Q100. (D) Trisomy. Explanation: Trisomy results from the presence of an extra chromosome.

